

April 20, 2022

**Via Electronic Filing**

Marlene H. Dortch  
Secretary  
Federal Communications Commission  
45 L Street, NE  
Washington, DC 20554

***Re: Amendment of Section 15.255 of the Commission's Rules, ET Docket No. 21-264***

Dear Ms. Dortch:

The undersigned companies hereby respond to the letter filed on February 18, 2022 (“IMQ Filing”), by Intel Corporation, Meta Platforms, Inc., and Qualcomm Incorporated (“Intel/Meta/Qualcomm”) in the above-captioned docket.<sup>1</sup> We agree that the “60 GHz band remains a band that fosters innovation while allowing [ ] important and very different technologies to successfully co-exist.”<sup>2</sup> However, the relief sought by Intel/Meta/Qualcomm is not consistent with a regulatory framework that enables an inventive and diverse ecosystem of technologies in the 60 GHz band.

Intel/Meta/Qualcomm seek rules that would prioritize certain unlicensed WiGig communications products over radar and other operators in the 60 GHz unlicensed band. Their pursuit of licensed-grade protection is wholly inconsistent with long-held principles that underlie successful operation and deployment of unlicensed spectrum technologies: technological neutrality, maximizing flexible use of Part 15 devices, and not favoring one unlicensed technology over another.<sup>3</sup>

Affording protection to one set of unlicensed technologies against interference from other unlicensed technologies would undermine the promise of innovation and the ability of the unlicensed technologies to develop fully to serve a broad variety of applications within the 60 GHz band.

Reasonable coexistence between unlicensed communications and radar technologies is possible in the 60 GHz band. Fair and objective studies using real-world scenarios and

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<sup>1</sup> Letter from Intel Corp., Meta Platforms, Inc., and Qualcomm Inc. to Marlene Dortch, Sec’y, FCC in ET Docket No. 21-264 (filed Feb. 18, 2022).

<sup>2</sup> *Id.* at 2.

<sup>3</sup> Indeed, it is a fundamental tenet of the Part 15 rules that unlicensed devices cannot claim protection from interference and must accept interference received from any authorized source, whether licensed or otherwise authorized user or from other unlicensed devices. See 47 C.F.R. § 15.5(b). Moreover, the existing rules provide that an unlicensed “intentional or unintentional radiator shall be constructed in accordance with good engineering design and manufacturing practice.” 47 C.F.R. § 15.15(a).

reasonable assumptions demonstrate that these technologies can coexist and perform in virtually all configurations. In contrast, the IMQ Filing:

- relies on unwarranted, irrelevant, and incorrect assumptions about the level of interference protection available in shared, unlicensed bands;
- focuses on extreme corner case operational scenarios;
- fails to capture the broad range deployment scenarios within the complexity of the operating environment;<sup>4</sup> and
- would promote a hierarchy among unlicensed technologies in an unlicensed band where low power radars would be considered secondary to other unlicensed devices.

The Commission should decline to dictate that unlicensed systems or specific use cases merit protection from others. Doing so would contravene policies based on flexibility, not proscription, that have proven foundational to the success of unlicensed spectrum technologies. Updates to the 60 GHz band rules adopted in this proceeding should instead reflect the Commission's longstanding policies of promoting innovation and technological neutrality, which require rules grounded in a framework of reasonable coexistence.

***Updated 60 GHz Band Rules Should Be Grounded in “Reasonable Coexistence” Principles That Have Been Foundational to the Success of Part 15 Unlicensed Spectrum Technologies.***

The record in this proceeding reflects the tremendous promise of the 60 GHz band, which possesses numerous unique characteristics key to enabling innovation and significant deployment of multiple technologies. For example, substantial available bandwidth at high frequencies enables radar applications yielding fine spatial recognition and motion detection. The propagation characteristics at 60 GHz naturally limit coverage for both radar and communications applications to line-of-sight or to near-line-of-sight. Due to atmospheric absorption, 60 GHz spectrum exhibits significantly higher free-space path loss than lower frequency bands, as well as high attenuation through objects such as drywall. These features enhance the potential for coexistence among a range of applications in the 60 GHz band and have generated widespread, significant, and sustained interest from a variety of industry stakeholders across the wireless ecosystem to develop new radar and communications systems and applications.

The undersigned companies, for example, envision a host of current and anticipated use cases extending to lifesaving detection systems in cars, health and wellness applications, and enhancements to device accessibility and usability.

The concept of “reasonable coexistence” should remain the Commission's lodestar in updating the 60 GHz rules. A wide range of devices and use cases should be allowed to operate within

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<sup>4</sup> The Commission has underscored the importance of technical analyses capturing typical deployment scenarios. See *In the Matter of Unlicensed Use of the 6 GHz Band; Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Report and Order and Further Notice of Proposed Rulemaking, 35 FCC Rcd. 3852 ¶ 244 (2020) (“6 GHz Order”).

the band and on equal footing as Section 15.5(b) of the rules contemplates.<sup>5</sup> Users of unlicensed devices in the 60 GHz band, as in other bands, are on notice that they should anticipate interference from other sources, such as other unlicensed devices operated locally, and should be provided guidance from manufacturers in configuring and operating their devices to minimize that interference. Unlicensed devices in the 60 GHz band should therefore be flexible enough to accommodate different technologies, applications, and innovations that are in existence or in development, or those that may not have been conceived of yet.

The IMQ Filing is rooted in assumptions that undermine the concept of reasonable coexistence. Intel/Meta/Qualcomm's testing purports to support restrictions on radar systems operating in the 60 GHz band rules that are intended to guarantee one-way wireless link packet latency within 10 milliseconds for 99% of all packets, even in rare configurations. The desire for 99% packet latency shorter than 10 milliseconds, however, is an unreasonable expectation for unlicensed use in the 60 GHz band. Such expectations are more appropriate for the highest priority licensees in a licensed band rather than in a shared, unlicensed band where Part 15 dictates an environment of reasonable coexistence.

Further, the need for a 10 millisecond target is questionable, and, in any event, 10 millisecond latency by communications devices may not even be achievable as a practical matter. Commission rules should not be based on studies assuming performance levels that contradict generally-held understandings. For example, latency investigations conducted for gaming confirm that a latency around 40 milliseconds to 60 milliseconds is acceptable.<sup>6</sup> This strongly suggests that a 20 milliseconds latency (the measured result in the IMQ Filing in the worst-case corner conditions) is a very fine latency. In any event, the results presented by Intel/Meta/Qualcomm indicate that the radar causes only around 3 milliseconds to 4 milliseconds additional one-way latency in WiGig devices for one corner case – an unrealistic static radar to static AR/VR application – that is negligible in the applications at issue. Well-designed unlicensed devices should be configured to accept this minimal amount of latency in an unlicensed band, and we note that the duration of any such modest interference can be

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<sup>5</sup> See note 3, *supra*. See also *In the Matter of Google LLC Request for Waiver of Section 15.255(c)(3) of the Comm'n's Rules Applicable to Radars used for Short-Range Interactive Motion Sensing in the 57-64 GHz Frequency Band*, Order, 33 FCC Rcd. 12542 ¶ 7, n.22 (2018) (The Commission explains that under its unlicensed rules, “we seek to foster an environment that encourages co-existence among a wide range of different unlicensed device types.”); *In the Matter of Mass. Inst. of Tech. Request for Waiver of Part 15 of the Comm'n's Rules Applicable to Ultra-Wideband Devices*, Order, 35 FCC Rcd. 4389, ¶ 15 (2020) (granting a Part 15 waiver to MIT's WiTrack system, in part, because “WiTrack's design and use can serve to promote coexistence between it and other unlicensed devices.”); *In the Matter of Amendment of Section 15.255 of the Comm'n's Rules*, Notice of Proposed Rulemaking, 36 FCC Rcd. 11901, ¶ 14 (2021) (describing policy of granting waivers “that do not result in harmful interference to incumbent licensed users or jeopardize coexistence with other unlicensed users”).

<sup>6</sup> See, e.g., CenturyLink, *How to Improve Your Gaming Latency*, <https://www.centurylink.com/home/help/internet/how-to-improve-gaming-latency.html> (last visited Apr. 20, 2022) and Paul Williams, *Gaming Latency Test: What is a Good Latency for Gaming?*, BANDWIDTH PLACE (Feb. 14, 2018), <https://www.bandwidthplace.com/the-importance-of-latency-in-online-gaming/> (last visited Apr. 20, 2022).

expected to be considerably less for in-motion WiGig use cases such as AR/VR. Moreover, assuming for the sake of argument that certain applications require a minimum latency of 10 milliseconds or less, WiGig manufacturers could avoid the 57-64 GHz band entirely by designing for use of WiGig Channel 4 (which would largely be unaffected by radar devices operating under the rules we support).

Intel/Meta/Qualcomm predicate their testing only on the AR/VR use case in extreme physical configurations—where a fixed radar device is pointed directly at a fixed WiGig device (in some cases the WiGig device is also pointed exactly at the radar device), placed in the same room and with an unobstructed path to the WiGig device, and at a distance of a few feet.<sup>7</sup> The testing also assumed near-complete overlap of a 2 GHz spectrum segment, and thus disregards avoidance in the frequency-domain.

Importantly, the Commission has determined that coexistence of unlicensed devices is to be promoted through less restrictive means, including by exercising control over the placement of an unlicensed device and by exercising choice over which unlicensed device is deployed.<sup>8</sup> For this reason, the appropriate starting point in this instance for determining reasonable coexistence is not examination of worst-case scenarios and edge cases, but consideration of likely and reasonable deployment scenarios. Here, that would include mobile devices (such as AR/VR headsets) being repositioned by a user adjusting locations, whether for personal reasons or to address experienced latency. It would also include multiple WiGig devices deployed in the same environment, potentially causing disruptions to other WiGig devices. These reasonable scenarios were not modeled in the IMQ Filing. Moreover, being “blocked or repeatedly interrupted” is not equivalent to experiencing harmful interference that prevents messages from being received.<sup>9</sup> Communications systems or other technologies should be designed with an appropriate level of resilience to handle these types of challenges. Further, we note that per the IMQ Filing, the latency is not materially affected, on the order of only 3 or 4 milliseconds. In most cases, the latency in the presence of the interfering simulated-radar signal

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<sup>7</sup> WiGig devices should not expect guaranteed latency levels in corner, worst-case situations, especially because, when such situations do occur, they are likely to be very transitory in most cases. Most AR/VR applications are unlikely to be fixed or static, but rather will be in-motion by definition, such that the radar typically will not point under the same (worst-case) polarization angle to the WiGig antenna. And in any event, users can change the locations or configurations of other RF devices they may be using to improve performance should noticeable interference ever be experienced. *Cf.* 47 C.F.R. 15.105(b), NOTE (providing sample language to be included in user manuals for Class B digital devices that expressly encourages users of radiofrequency equipment causing harmful interference to radio or television reception to “try to correct the interference by . . . [r]eorient[ing] or relocat[ing] the receiving antenna[; or . . . i]ncreas[ing] the separation between the equipment and receiver.”).

<sup>8</sup> 6 GHz Order ¶ 222.

<sup>9</sup> The data rate of a WiGig system operating co-channel with radar systems under the rules we support would not be influenced materially as shown by measurements provided by Google, Infineon, and Texas Instruments/Peraso submitted in this record. See Comments of Google LLC in ET Docket No. 21-264, Attachments A-D (filed Sept. 20, 2021); Reply Comments of Infineon Techs. Ams. Corp. in ET Docket No. 21-264, Exhibit A (filed Oct. 18, 2021); Reply Comments of Texas Instruments Inc. in ET Docket No. 21-264, Attachment (filed Oct. 18, 2021).

can be expected to be below the target threshold; when it does exceed that threshold in the corner cases presented based on boresight orientation and close proximity, it is typically only slightly above 10 milliseconds and well within 20 milliseconds.

The benefit of unlicensed spectrum—“permissionless innovation”—should not come with the stringent regulatory non-interference burdens reserved for licensed frequency bands and with burdens inconsistent with the spectrum policies that have made Part 15 a resounding success. Indeed, setting such a precedent in the 60 GHz band runs the risk of upsetting the sharing ecosystem in other unlicensed bands and opening the door to regulations that tip the scales toward certain unlicensed innovations over others in bands currently under consideration.

### ***Flaws and Omissions in the IMQ Filing Make It of Limited Use in Updating Rules for the 60 GHz Band***

In addition to its foundationally incorrect assumption (*i.e.*, that reasonable coexistence should ensure wireless link packet latency within 10 milliseconds for 99% of all packets for a particular, future AR/VR/XR application in *all* configurations relative to 60 GHz radar devices, no matter how unlikely or transitory), the IMQ Filing suffers from a host of other issues:

- The radar and communications technologies under study were confined to operations within the same 2 GHz channel, indeed, precisely on a co-channel basis.
- No tests were done with 7 GHz bandwidth radar and a WiGig channel of 2 GHz. This is important because, for the same chirp (*i.e.*, on) time, the wider bandwidth of the radar should reduce the interference on WiGig by approximately two-thirds over time.
- The IMQ Filing disregards the essentially mobile operation of WiGig devices, which would likely render any interference experienced extremely transitory. As noted above, the test design was static with the antennas appearing to have been aligned directly with the radar at the WiGig devices, and in some cases with the WiGig antenna pointed directly at the radar device.
- The IMQ Filing assumes the path between the radar and the WiGig antenna is completely unobstructed, with separation as small as one meter. As noted above, at a distance this small, the user can correct for interference by simply moving one of the devices.
- For in-motion operations like AR/VR, small changes in the polarization angles between the TX/RX antennas of the two systems can help tremendously to reduce interference. Infineon, for example, investigated a different angle configuration showing much less interference for relative polarization angles greater than 0° between both antenna systems.<sup>10</sup> But Intel/Meta/Qualcomm tested only the worst-case relative polarization angles and thus the corner case.
- There is no discussion of potential ways to optimize the operation of the AR/VR/XR devices to work better with the radar. For instance, it is not clear that effort was made to operate the AR/VR/XR device in an airtime-optimized manner (*e.g.*, by operating at a higher data rate and higher MCS level using more bandwidth). Given that

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<sup>10</sup> See Attachment to Letter from Edward A. Yorkgitis, Jr., Counsel to Infineon Techs. Ams. Corp., to Marlene Dortch, Sec’y, FCC, in GN Docket No. 14-177 (filed June 23, 2021).

Intel/Meta/Qualcomm have explicitly stated that their concerns are regarding future, unreleased devices, such optimization in design and manufacture as well as in operation is an expected part of reasonable coexistence and unlicensed band operation.<sup>11</sup>

- The IMQ Filing lacks detail on why the 99% percentile latency was chosen.
- The IMQ Filing only examined potential interference between a radar and an AR/VR/XR device operating co-channel, but did not account for potential interference effects on the AR/VR/XR devices of other WiGig-based technologies (including another AR/VR/XR device) operating in the same spatial and frequency vicinity. Because the baseline data on latency distribution is close to the target to start with, it is not clear whether it is robust enough to withstand WiGig to WiGig interference. Just as the Commission should not consider restrictions based on corner case configurations, it should also decline to consider restrictions on 60 GHz radar systems to protect WiGig devices when the WiGig proponents of such restrictions have failed to assess the potential for WiGig devices to operate in close proximity.
- Information necessary to understand the implications of the testing or to replicate the results was not included, such as: (i) details about the devices used for testing, including antenna characteristics (e.g., type, gain, pattern, polarization), transmission power levels, and whether beamed or omnidirectional transmissions were used; (ii) operating characteristics in each testing scenario such as signal-to-noise ratio, received power of radar and WiGig signals, modulation coding schemes, frame durations, *etc*; (iii) whether Clear Channel Assessments were performed and at what levels; and (iv) details about data passed, traffic load and injection, radar timing synchronization, bit rate, and MCS.

The undersigned companies remain open to working with Intel/Meta/Qualcomm to consider solutions for the 60 GHz band that facilitate “reasonable coexistence.” We believe continued dialogue among interested parties is valuable for the purposes of developing more resilient systems better able to coexist. This collaboration, however, should not be an antecedent to the adoption of more flexible rules for 60 GHz technologies. While we welcome the Commission’s encouragement for ongoing conversations between stakeholders, we request that the Commission decline proposals that would prioritize some unlicensed technologies over others and instead update its rules as advocated in our companies’ filings in this docket for the 60 GHz band consistent with a flexible Part 15 framework without further delay.

Respectfully submitted,

*Acconeer AB, Amazon.com Services LLC, Google LLC, Infineon Technologies Americas Corp. (an Infineon Technologies AG company), and Texas Instruments Incorporated*

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<sup>11</sup> See, e.g., IMQ Filing at Attach. Slide 14 (stating that “[l]atency-critical communications applications like AR/VR/XR are at early deployment stages”); Reply Comments of Facebook, Intel, and Qualcomm in ET Docket No. 21-264, 1-2 (filed Oct. 18, 2021) (noting that “WiGig applications, generally, and the types of low latency AR/VR/XR applications that are most vulnerable to interference from radar, in particular, have yet to be deployed on a large scale—even though they are expected to be in the coming years.”).